

# Halon Extinguishing Agents: Safety & Health Concerns

*Halon is an odorless, colorless gas that can cause asphyxiation;*

*Pressurized fire suppression system cylinders are hazardous and if not handled properly they are capable of violent discharge. The cylinder can act as projectile, potentially causing injury or death.*

## Introduction

Halogenated (Halon) fire extinguishers are used throughout industry and the military to protect personnel and sensitive equipment/systems. Halon leaves no corrosive or abrasive residue after release, minimizing clean up. Its nonconductive qualities make it ideal for fire suppression in electronics and electrical equipment. Halon is a fast and reliable fire suppression agent; it can be used in many unique systems or places including:

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| ! | Flammable liquid storage tanks;        | ! | Turbine or engine compartments; |
| ! | Electronic and electrical cabinets;    | ! | Computer rooms;                 |
| ! | Under floor spaces;                    | ! | Kitchens; and                   |
| ! | Aircraft engine nacelles and dry bays; | ! | Paint booths.                   |

Halon also presents health and safety concerns for personnel exposed to the agents and its release. Few people know the proper safety precautions to protect themselves or others from exposure. Employers who use halon extinguishers should include halon products in their hazard communications program and train their employees on the actions to take if a halon extinguisher is discharged.

**Purpose:** *Employee Awareness of Halon Hazards.*

## Halon Fire Suppression Agents

There are many different halon compounds that exist; only a few are used in fire extinguishers. The commonly used extinguishing agents are Halon 1011, Halon 1211, Halon 1202, Halon 1301, and Halon 2402. Halon 1301 is considered the least toxic, but also the least effective of the five.

## Halon Naming System

The halon system for naming halogenated hydrocarbons was devised by the US Army Corps of Engineers.

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| ! | First digit = # of carbon (C ) atoms in the molecule; |
| ! | Second digit = # of fluorine (F);                     |
| ! | Third digit = # of chlorine (Cl);                     |
| ! | Forth digit = # of bromine (Br); and                  |
| ! | Fifth digit = # of iodine (I).                        |

For example Halon 1301 has one carbon atom, three fluoride, no chlorine, one bromine, and no iodine.

## Fire Extinguishment Characteristics.

Halon fire extinguishes agents act by removing the active chemical species involved in the flame chain reaction (chain breaking). Without out the chain reaction fuel, oxygen, and heat will not combine and continue combustion.

### **Safety and Health Hazards of Halon**

Worksites or equipment that contain halon extinguishers systems should have Material Safety Data Sheets (MSDS) for the type of halon used. Employees must be aware of the potential hazards of halon exposure and know what to do when halon is released. It is important that employers are aware of the type of halon used in their workplace, because their toxicities differ. Halon extinguisher systems usually do not release high enough concentrations of halogenated agents to cause life threatening effects but some systems carry up to 30% by concentration and can be dangerous.

The five above mentioned halon types have a low toxicity but proper precautions must be taken if an employee is exposed, especially to decomposition products. Other types of halon are more toxic (Halon 1001- methyl bromide and Halon 1011 - Chlorobromomethane), and may still be in use today. If the halon system in your worksite contains Halon 1001, Halon 1011, or other unmentioned types, you must obtain information about them to protect your employees accordingly.

Unnecessary exposure of personal to either the natural agent of decomposition products should be avoided. Decomposition results from exposure of the agent to fire or other hot surfaces. Halon is about five times heavier than air and will settle to the bottom of enclosed or confined spaces.

Halon hazards include:

- ! Asphyxiation - Although unlikely to occur during use of a single fire extinguishing unit, exposure to high concentrations of halon gas may cause an oxygen deficient atmosphere.
- ! Flying Projectile - If the cylinder is mishandled and the pressure is released in an uncontrolled manner, the cylinder can act as a projectile causing serious injury or death to people working with the cylinder or bystanders in the vicinity.
- ! Cold Temperature - Direct contact with the vaporizing liquid being discharged will have a strong chilling effect and can cause frostbite burns to the skin.
- ! Central Nervous System (CNS) - Inhaling high concentrations of halon gas can cause dizziness, tingling in extremities, and in severe cases, unconsciousness.
- ! Cardiovascular Effect - Exposure can cause cardiac sensitization. Cardiac sensitization occurs when a chemical causes an increased sensitivity of the heart to adrenaline producing sudden life-threatening, irregular heartbeats and even heart attack, in severe cases.
- ! Irritation of exposed skin and eyes may also result from exposures to halon.

Decomposition products of halon can be very toxic. The decomposition takes place when halon is exposed to a flame or to a hot surface at or above 900 degrees F. During decomposition the atoms of the halon molecule breakdown and can create high concentrations of toxic gases. Before entering into an area where a large fire was extinguished, toxic atmosphere tests should be done to ensure safe entry and occupancy of

the area.

By itself halon present a low hazard but when combined with out hazardous situation it can be a major problem. If workers must enter into a space with limited ventilation the atmosphere must be tested for oxygen levels. If the oxygen level is below 19.5% than the space is considered oxygen deficient and a self-contained breathing apparatus (SCBA) is required.

### **First Aid Measures**

If exposure occurs, the victims must be moved to fresh air immediately. Trained personal should administer supplemental oxygen and CPR if needed. Only trained personnel should administer supplemental oxygen. Remove contaminated clothes. Rinse skin with plenty of water or shower.

In case of frostbite, place the frostbitten part in warm water. If warm water is not available, or impractical to use, wrap the affected parts gently in blankets.

If exposure causes obvious distress, victim (s) and rescuers must be taken for medical attention. Take a copy of the product label and MSDS to the physician or health professional, with victim.

### **Spill and Leak Response**

Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment must be used. If there is a release of halon, clear the affected area, protect people, and respond with trained personnel. The surrounding area must be monitored for oxygen content and if it is bellow 19.5 than SCBAs are required. Anytime there is a halon release employees must be evacuated and the work atmosphere checked for oxygen levels.

### **Handling and Storage**

All employees who handle a halon product should be trained to handle it safely.

#### **Safety Tips:**

- ! Keep cylinders in dry, well-ventilated areas that are away from heat.
- ! Keep cylinders secure and in an area where they will not be damaged.
- ! Avoid getting chemicals on you or in you.
- ! Wash hands after handling chemicals.
- ! Do not eat or drink around or when handling chemicals.
- ! Be aware of signs of dizziness or fatigue; exposures to fatal concentrations of halon could occur without any significant warning symptoms.

### **Conclusion**

Halon is one of the most effective fire extinguisher agents used. Even though it is considered to have low toxicity, safety and health problems can occur from its release. Employer that use halon should develop a written policy to train their employees who may be exposed. Training should consist of first aid procedures, spill and leak response, safe handling and storage, and recognizing signs and symptoms of exposure.

## Resources

Additional information about halon, occupational safety and health issues standards and regulations can be obtained from:

**1. National Fire Protection Association, (NFPA).**

P.O. Box 9101, One Batterymarch Park, Quincy, MA 02269-9101.

Phone: 1-800-344-3555, Fax: 1-617-770-0700

[www.nfpa.org](http://www.nfpa.org)

**2. U.S. Department of Labor, Occupational Safety & Health Administration, (OSHA).** Public Affairs Office- Room 3647, 200 Constitution Ave., Ashington, D.C. 20210.

Phone: 1-202-693-1999.

[www.osha.gov](http://www.osha.gov)

**3. National Institute for Occupational Safety and Health, (NIOSH).** Department of Health and Human Services,

200 Independence Ave. SW 317B, Washington, DC 20201.

Phone: 1-800-356-4674, 1-800-35-NIOSH

[www.niosh.gov](http://www.niosh.gov)

**4. American Conference of Governmental Industrial Hygienists, (ACGIH).**

1330 Kemper Meadow Drive, Cincinnati, OH 45240-1634.

Phone: 1-513-742-2020, Fax: 1-513-742-3355

[www.acgih.org](http://www.acgih.org)